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67658

SOV/126-8-6-5/24

AUTHORS: Novogrudskiy, V.N., Samokhvalov, A.A. and Fakidov, I.G.

TITLE: On the Hall Effect in Ferromagnetics ✓

PERIODICAL: Fizika metallov i metallovedeniye, 1959, Vol 8, Nr 6,
pp 834-836 (USSR)

ABSTRACT: In spite of the fact that there exists a considerable amount of experimental material on the Hall effect in ferromagnetics, there is so far no final theory of this effect. The Hall effect is most frequently described by a formula of the form

$$E_x = R_0 H + R_1 M \quad (1)$$

where R_0 is the Hall constant for the "usual" part of the effect, R_1 is the Hall constant for the ferromagnetic part, H is the magnetic field strength inside the specimen and M is the magnetization of the specimen. Another way of describing this effect is by the use of the formula

$$E_x = R (H_0 + \alpha M) \quad (2)$$

Card 1/4 where $\alpha = R_1/R_0$. It is further assumed that the "usual" ✓

67658

SOV/126-8-6-5/24

On the Hall Effect in Ferromagnetics

Hall constant is determined by the concentration of conduction electrons n . If current carriers of one sign only are present, $R = 1/cen$. The weak temperature dependence of R_0 in some ferromagnetic metals and alloys can be explained by taking into account the interaction between s and d electrons (Ref 7 and 8). However, there exists another approach in which the Hall effect in ferromagnetics is described by a formula of the form

$$E = R_1 M + R_i M_i \quad (3)$$

where R_1 and M have the same meaning as above and R_i is a Hall constant associated with the true magnetization of the ferromagnetic on saturation. According to this point of view, the constant R_i is associated with the appearance of a Hall emf due to a change in the spontaneous magnetization, and the constant R_i is not as simply related to the concentration of conduction electrons as is R_0 . Experimental data confirm both of these points of view. It is known that the current carrier concentration calculated from the expression

Card 2/4

67658

SOV/126-8-6-5/24

On the Hall Effect in Ferromagnetics

$R_0 = 1/cen$ gives $n \sim 10^{22} \text{cm}^{-3}$ (Ref 11). Experiments carried out on magnetite by the present authors (Ref 12) have shown that conduction electron concentration determined from the magnitude of R_0 is strongly dependent on temperature and its magnitude is in accordance with a semiconductor character of the electrical conductivity of magnetite. The value of the conduction electron concentration determined from the magnitude of R_0 is in agreement with the value obtained from measurements of the thermal emf in magnetite (Ref 13). On the other hand, Bazhanova (Ref 10) has confirmed experimentally the point of view expressed by Eq 3. In the opinion of the present authors, in the general case, the Hall effect in ferromagnetic metals and semiconductors must be described by a formula of the form

$$E_x = R_0 O + R_1 M + R_1 M_i \quad (4)$$

where all the Hall constants and magnetic quantities have the same meaning as in the previous equations.

Eq (4) is confirmed by all the existing data on the Hall effect at all temperatures. It is suggested that it will

Card 3/4

67658

SOV/126-8-6-5/24

On the Hall Effect in Ferromagnetics

be desirable to have more detailed experimental data above and below the ferromagnetic transformation temperature in substances in which the three terms are comparable. There are 14 references, 7 of which are Soviet, 6 English and 1 German.

ASSOCIATION: Institut fiziki metallov AN SSSR
(Institute of Physics of Metals, AS USSR)

SUBMITTED: May 17, 1959

Card 4/4

S/520/59/000/022/007/021
E032/E414

AUTHOR: Samokhvalov, A.A.

TITLE: On the Effective Magnetic Field in the Even Galvanomagnetic Effect in Magnetite

PERIODICAL: Akademiya nauk SSSR. Ural'skiy filial, Sverdlovsk. Institut fiziki metallov. Trudy, No.22, 1959, pp.55-58

TEXT: In a previous paper (Ref.1) the present author and Fakidov showed that, in the case of the Hall effect and the change of resistivity with the magnetic field in magnetite, the effective magnetic field acting on the conduction electrons is the same and is given by $H_{eff} = H_i + 4\pi\alpha M$ where α is the effective field parameter which can change sign depending on the effect, H_i is the internal magnetic field in the specimen and M is the magnetization of the specimen. The present paper reports more detailed measurements of the magnetic characteristics of magnetite and the results reported in Ref.1 are amplified and extended. The experimental procedure was as described in Ref.1 for specimen 2. The magnetite specimen, which was in the form of a plate (4.87 x 9.30 x 2.16 mm), was cut from a natural single crystal of magnetite parallel to the (111) plane. The even
Card 1/5

On the Effective Magnetic ...

S/520/59/000/022/007/021
E032/E414

galvanomagnetic effect (both longitudinal and transverse) was measured in the region between 0 and +100°C. In order to measure the transverse galvanomagnetic effect, the magnetic field was made perpendicular to the (111) plane and the direction of the current, which lay in the (111) plane. In the measurement of the longitudinal effect, the specimen was rotated through 90° so that the magnetic field and the current were in the same direction in the (111) plane. The magnetization curves were obtained by the ballistic method as follows. In the case of the longitudinal position of the specimen, the induction was measured as a function of the external magnetic field with the aid of a coil wound on the specimen near its mid-point. The internal magnetic field in the specimen was also measured using a special thin search coil. The resistivity was measured using a compensation method (potentiometer) and a galvanometer having a sensitivity of 4×10^{-8} V/div. Fig.1 shows the relative change to the resistance as a function of the external magnetic field (in oersted) at $t = 62.8^\circ\text{C}$. The longitudinal and transverse effects are indicated by || and \perp respectively. The curves obtained at other temperatures were

Card 2/5

On the Effective Magnetic ...

S/520/59/000/022/007/021
E032/E414

found to be similar to those shown in Fig.1. Fig.2 shows the relative change in the resistance as a function of temperature for a field of 13100 oersted. Fig.3 shows the magnetization (gauss) as a function of the external magnetic field. Fig.4 and 5 show the dependence of the relative change in the resistance on the square of the effective magnetic field $(H_i + 4\pi\alpha M)^2$. The two curves were obtained at 62.8°C and the value of α in the former figure is $\alpha = 4$ and in the latter figure $\alpha = 15$. Similar results were obtained for all the $\Delta r/r$ versus (H) curves in the temperature region 0 to 100°C. In all cases $\alpha_{\perp} < \alpha_{\parallel}$ and the temperature dependence of $(\alpha_{\perp} + \alpha_{\parallel})/2$ was the same as for α determined from the Hall effect. When $\Delta r/r$ is plotted as a function of the square of the magnetization, the characteristic break in the curve does not occur. It is suggested that the true characteristic which determines the even galvanomagnetic effects in magnetite is the square of the effective magnetic field and not the square of the magnetization as in the case of many other paramagnetic metals and alloys. I.G.Fakidov is thanked for directing this work. There are 5 figures and 3 Soviet references.

Card 3/5

81353

S/181/60/002/03/07/028
B006/B017

24.7600

AUTHORS: Samokhvalov, A. A., Fakidov, I. G.

TITLE: Galvanomagnetic Properties¹⁾ of a Magnetic Single Crystal
in the Temperature Range 0 ÷ 100°C

PERIODICAL: Fizika tverdogo tela, 1960, Vol. 2, No. 3, pp. 414-419

TEXT: The aim of the authors was to investigate the galvanomagnetic effects of magnetite in a temperature range which was sufficiently distant from the Curie point and the low-temperature transition range in order to explain the characteristic features of the Hall effect and the changes of electrical resistance in the magnetic field of a semiconducting ferromagnetic material. The investigations were made on two samples of naturally-occurring magnetite which were split off from a large octahedral single crystal parallel to (111). Sample 1 on which the Hall effect was measured had a size of 4.72x6.80x2.26 mm³, sample 2 on which the conductivity changes were measured in the longitudinal and the transverse fields had a size of 4.87x9.30x2.16 mm³. The position of the samples in

Card 1/3

81353

Galvanomagnetic Properties of a Magnetic
Single Crystal in the Temperature Range
 $0 \div 100^{\circ}\text{C}$

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B006/B017

the magnetic field is schematically illustrated in Fig. 1. The Hall effect was measured at field strengths of up to 20,000 oe at 10.1, 17.9, 22.1, 38, 61.6, and 93.6°C. The primary current flowing through the samples was between 20 and 100 ma; most of the measurements were made at 40 ma. Fig. 2 shows the Hall curves for 22 and 61.6°C; they are similar for the other temperatures. The Hall effect is given by the formula $E_x = (R_0 H - R_1 4\pi M) j b$, where H is the field strength, M the magnetization of the sample, R_0 and R_1 the Hall constants of the "ordinary" and the ferromagnetic parts (both have opposite signs), j the primary current density, and b the width of the sample. Fig. 3 shows $R_1(T)$, Fig. 4 $R_0(T)$. The width of the forbidden zone was determined from several series ($\Delta E \approx 0.03 - 0.05$ ev). The change of the resistivity of magnetite in the magnetic field was measured up to 13,000 oe at 21.6, 33.9, 47.2, 62.8, 72, 82, and 94.1°C. Fig. 5 shows the temperature dependence of resistivity, Fig. 6 $\frac{\Delta \rho}{\rho} (H)$, and Fig. 7 $\frac{\Delta \rho}{\rho} (T)$ for longitudinal and transverse fields. The magnetization curves were measured on two samples perpendicular to one another (Fig. 8). In

Card 2/3

Galvanomagnetic Properties of a Magnetic
Single Crystal in the Temperature Range
 $0 \div 100^{\circ}\text{C}$

81353

S/181/60/002/03/07/028
B006/B017

the longitudinal position, saturation occurs at $H_e = 800 - 1,000$ oe, in transverse position at $3,800 - 4,200$ oe. The results of the investigations are compiled as follows: 1) in the temperature range investigated, R_0 , R_1 , the resistivity ρ , and $\rho(H)$ increase with reduced temperature; 2) $R_1 \sim \rho^m$ (Fig. 9 shows that $\ln R_1 = f(\ln \rho)$); 3) The temperature courses of R_0 and ρ correspond to a reduction in electron conductivity ($n \approx 10^{20}/\text{cm}^3$) and to an increase in their mobility ($u \approx 6 \text{ cm}^2/\text{v}.\text{sec}$) with reduced temperature, which is in agreement with the semiconductor character of the electrical conductivity of magnetite. N. S. Akulov is mentioned. There are 9 figures and 11 references: 5 Soviet, 3 US, 1 Dutch, 1 Japanese, and 1 German.

ASSOCIATION: Institut fiziki metallov Sverdlovsk (Institute of Metal Physics, Sverdlovsk)

SUBMITTED: May 25, 1959

Card 3/3

68479

S/126/60/009/01/006/031

EO91/E191

24.7600

AUTHORS: Samokhvalov, A.A., and Fakidov, I.G.

TITLE: Nernst-Ettingshausen Thermomagnetic Effects in Magnetite

PERIODICAL: Fizika metallov i metallovedeniye, 1960, Vol 9, Nr 1,
pp 31-35 (USSR)

ABSTRACT: Measurements were carried out on three specimens which were cut out from a natural monocrystal of magnetite in the (111) plane. The specimens were plates of the following dimensions: 17.70 x 7.44 x 2.36 mm (specimen 1) and 9.22 x 6.99 x 2.18 mm (specimen 2). In the measurements of the longitudinal N-E effect, the direction of the e.m.f. measured coincided with that of heat flow in the plane (111) in the direction [110]. The experimental set-up and the position of the electrodes were the same as those used in measuring the temperature dependence of the thermoelectric power by Samokhvalov et al (Ref 4). For measuring the transverse N-E effect, at low values of the latter, the set-up was altered somewhat in order to increase the temperature difference in the specimen (Fig 1). The temperature of the specimen was measured by a copper-constantan thermocouple which

Card
1/4

68479

S/126/60/009/01/006/031

E091/E191

Nernst-Ettingshausen Thermomagnetic Effects in Magnetite

was soldered to the sides of the specimen. In all cases the magnetic field coincided with the crystallographic direction [111] of the magnetite. Measurements were carried out by the usual compensation method (see, e.g. Ref 5) by means of a KL-48 potentiometer and a GPZ-2 galvanometer. When the effects were small, measurements were carried out with an amplifier of the FEOU-18 type, with a sensitivity of 4×10^{-9} V/mm. In measurements of the transverse N-E effect, the temperature difference in the specimen was maintained at from 10 to 13 °C in the transformation range, and from 30 to 60 °C at room temperature. During the longitudinal effect measurements the temperature difference was 4-10 °C. The magnetisation curve of magnetite in the transformation range depends essentially on the mode in which the specimen had been cooled, i.e. whether the specimen had been cooled in a magnetic field or not. In order that the experimental conditions should be identical, the measurements of the effects in the transformation range were always carried out during heating of the specimen from liquid nitrogen temperature to which the specimen had been first cooled

Card
2/4

68479

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E091/E191

Nernst-Ettingshausen Thermomagnetic Effects in Magnetite

without application of magnetic field. In order to avoid spurious e.m.f.'s the effects were measured for various directions of the magnetic field; prior to measurement, the specimens were demagnetised. Fig 2 shows the temperature dependence of the dimensionless magnitude of the transverse N-E effect, measured at a magnetic field intensity H , of 20,400 oersted (specimen 1). The dependence of the N-E effect on the magnetic field intensity at a temperature of 228 °K and with a temperature difference of 60 °C across the specimen, is shown in Fig 3. Fig 4 shows the temperature dependence of the longitudinal N-E effect in magnetite at $H = 20,400$ oe. Fig 5 shows the dependence of the longitudinal N-E effect in magnetite on the magnetic field intensity at various temperatures. From the experimental values of the effective magnetic field the mobility of current carriers in magnetite can be estimated according to formulae of the kinetic theory of transport processes in semiconductors. The magnitude and temperature dependence of the mobility thus obtained (in the ferromagnetic state)

Card
3/4

68479

S/126/60/009/01/006/031
E091/E191

Nernst-Ettingshausen Thermomagnetic Effects in Magnetite

coincide in their order of magnitude with the Hall mobility (Refs 1, 2). The negative sign of the transverse N-E effect (in the region of the usual ferromagnetic state of magnetite) represents scattering of current carriers by the optical oscillations of the lattice. This confirms the view held about the preferentially ionic nature of the interatomic bonding forces in magnetite. The sharp anomalies in thermomagnetic effects in the region of low temperature transformations show that there must be a radical change in the energy spectrum of the conduction electrons. The existence of the anomalous behaviour of $\Delta\alpha/\alpha$ (the transverse N-E effect) at a temperature of 93 °K confirms the hypothesis (Refs 3, 4) that some phenomena, associated with low temperature transformation, can occur in a wide temperature range (of the order of 14-18 °C).

Card
4/4

There are 5 figures and 6 Soviet references.

ASSOCIATION: Institut fiziki metallov AN SSSR

(Institute of Physics of Metals, Acad.Sci. USSR)

SUBMITTED: March 12, 1959

85038

S/126/60/010/004/006/023
E201/E491

9.4300 (1137, 1138, 1143)

AUTHORS: Samokhvalov, A.A., Fakidov, I.G. and Kopytov, Ye.I.

TITLE: The Anomaly of Very-High-Frequency Permittivity of Antiferromagnetic Semiconductors at the Néel Temperature

PERIODICAL: Fizika metallov i metallovedeniye, 1960, Vol.10, No.4, pp.538-542

TEXT: A waveguide method was used at 9500 Mc/s to study the permittivity anomaly of Cr_2O_3 at the Néel temperature of 33 to 37°C. Cr_2O_3 is an antiferromagnetic semiconductor with very low electrical conductivity (10^{-9} - 10^{-14} ohm $^{-1}$ cm $^{-1}$) at room temperature. Its forbidden bandwidth depends on many factors and ranges from 0.4 to 0.8 eV; on transition through the Néel point the activation energy jumps by 0.08 eV. Samples were made from Cr_2O_3 powders of 4DA (ChDA) purity by pressing (5000 kg/cm 2) and subsequent firing at 800 to 900°C. Before measurement the samples were dried by vacuum heating at 400°C. The circuit used in measurements is shown in a figure on p.540. A klystron oscillator of 51-M (51-I) type was used as the source. A standard waveguide line, with an indicator making it possible to measure the standing-wave minimum to within 0.01 mm, was employed. The signal was passed to a narrow-Card 1/3

85038

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E201/E491

The Anomaly of Very-High-Frequency Permittivity of Antiferromagnetic Semiconductors at the Néel Temperature

band amplifier of 21-ИМ (21-IM) type or to a ГПЗ-2 (GPZ-2) galvanometer. Both the amplifier and the klystron oscillator had stabilized power supplies. Permittivity was measured with an additional waveguide section (1 in the figure) insulated from the main waveguide by a thin mica plate. A sample was heated with an oven (2 in the figure) and its temperature was measured with a copper-constantan thermocouple (5). The sample (4) was placed at the short-circuited end of the section 1 or at a quarter-wavelength from the short-circuited end, i.e. in the open-circuit position. Complex permittivity was found from displacement of the standing-wave minimum and from measurements of the standing-wave ratio, deduced from the width of the standing-wave minimum. It was found that on transition to the paramagnetic state the real component of permittivity increased discontinuously by 3 to 4%. This jump may affect markedly the changes of the energy spectrum on destruction of the antiferromagnetic spin order at the Néel temperature. The authors point out that similar permittivity jumps were observed in other antiferromagnetics such as MnS, FeO etc. The authors

Card 2/3

85038

S/126/60/010/004/006/023
E201/E491

The Anomaly of Very-High-Frequency Permittivity of Antiferromagnetic Semiconductors at the Néel Temperature

measured also the dispersion of permittivity between 100 and 10^8 c/s: permittivity was 16 ± 1 at 100 c/s, decreasing monotonically with frequency and reaching 3.8 ± 0.3 near 10^8 c/s. (The latter was the value obtained at 9500 Mc/s and 20°C.) There are 1 figure and 12 references: 2 Soviet, 6 English, 3 French and 1 translation from English into Russian. ✓

ASSOCIATION: Institut fiziki metallov AN SSSR
(Institute for Metal Physics, AS USSR)

SUBMITTED: March 9, 1960

Card 3/3

SAIMOKHVALOV, A. A.

PHASE I BOOK EXPLOITATION SOV/AB93

Vsesoyuznoye soveshchaniye po fizike, fiziko-khimicheskim svoystvam ferritov i fizicheskim osnovam ikh primeneniya. 3d, Minsk, 1959

Perrity: fizicheskiye i fiziko-khimicheskiye svoystva. Doklady (Ferrites: Physical and Physicochemical Properties. Reports) Minsk, Izd-vo AN BSSR, 1960. 655 p. Errata slip inserted. 4,000 copies printed.

Sponsoring Agencies: Nauchnyy sovet po magnetizmu AN SSSR. Otdel fiziki tverdogo tela i poluprovodnikov AN BSSR.

Editorial Board: Resp. Ed.: N. M. Sirota, Academician of the Academy of Sciences BSSR; K. P. Batov, Professor; Ye. I. Kondorskiy, Professor; K. M. Polivanov, Professor; R. I. Shadrin, Professor; G. A. Smolenskiy, Professor; M. N. Shklyarskiy, Candidate of Physical and Mathematical Sciences; R. M. Shteynshteyn, and L. A. Bashkurov; Ed. of Publishing House: S. Kholyavskiy; Tech. Ed.: I. Volokhanovich.

PURPOSE: This book is intended for physicists, physical chemists, radio electronics engineers, and technical personnel engaged in the production and use of ferromagnetic materials. It may also be used by students in advanced courses in radio electronics, physics, and physical chemistry.

COVERAGE: The book contains reports presented at the Third All-Union Conference on Ferrites held in Minsk, Belorussian SSR. The reports deal with magnetic transformations, electrical and galvanomagnetic properties of ferrites, studies of the growth of ferrite single crystals, problems in the chemical and physicochemical analysis of ferrites, studies of ferrites having rectangular hysteresis loops and multicomponent ferrite systems exhibiting spontaneous rectangularity. Problems in magnetic attraction, highly coercive ferrites, magnetic spectroscopy, ferromagnetic resonance, magneto-optics, physical principles of using ferrite components in electrical circuits, anisotropy of electrical and magnetic properties, etc. The Committee on Magnetism, AS USSR (S. V. Vonsovskiy, Chairman) organized the conference. References accompany individual articles.

SOV/AB93

Perrites (Cont.)

Saimokhvalov, A. A. and I. G. Pakidov. The Electrical Properties of Ferrite (Electrical Conductance, Galvanomagnetic, Thermoelectric, and Thermomagnetic Properties of Ferrites in the Temperature Range of 80 - 400 K)	272
Kondrov, Ye. M., and V. A. Stogova. Electrical Properties of Some Ferrites	286
Zotov, T. D. The Effect of Low-Temperature Thermomagnetic Treatment of a Magnetite Single Crystal on Its Electrical Resistance	298
Shol'ts, N. M., and L. Ya. Shestskina. Preparation Method and Properties of Barium Oxide Magnets	302
Shur, Ya. S., and G. S. Kandaurova. The Magnetic Structure of a Barium Ferrite	311
Telesin, R. V., and Ye. P. Kuznetsova. Temperature Dependence of Some Properties of Manganese-Zinc Ferrites	320

Card 10/18

June 9/10

39658
S/137/62/000/007/061/072
A160/A101

9.6150
21.6000
AUTHORS: Samokhalov, A. A., Pakidov, I. G.

TITLE: The use of photocells in combination with phosphors for recording betatron, gamma and X-ray radiations

PERIODICAL: Referativnyy zhurnal, Metallurgiya, no. 7, 1962, 81, abstract 7I543-
(In collection: "Betatronnaya gamma-defektoskopiya stali". Moscow, AN SSSR, 1961, 52 - 55)

TEXT: The selenium JI3TH (LETI)-type photocell and the vacuum phototube were used, in combination with phosphors as detectors of γ -radiations, for recording the γ -radiation of a betatron (from 22 Mev to 0) and Co^{60} isotope and the X-ray radiation. The current of the photocell was recorded with a galvanometer having a sensitivity of $5 \cdot 10^{-10} \text{ a/mm} \cdot \text{m}$. Presented are data on the sensitivity to these radiations, arising in different combinations of the photocell with phosphors. The results of the experiments revealed that it is possible to build detectors for the γ -radiation of betatron and Co^{60} and the X-ray radiation when combining the photocell with various phosphors. Their sensitivity slightly depends on the hardness of the radiation, and equals $10^{-8} \frac{\text{p}}{\text{min}}$ when using a se-

Card 1/2

S/137/62/000/007/061/072
A160/A101

The use of photocells in combination with...

lenium photocell, and $10^{-10} \frac{\text{a}}{\text{p/min}}$ when using a vacuum phototube. It is shown that the simple phosphor-photocell-galvanometer device may serve as a monitor for medium and highly-intensive radiations.

N. Kunina

[Abstracter's note: Complete translation]

Card 2/2

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S/181/61/003/006/002/031
B102/B201

X

24.7600
AUTHORS:

Davidenko, N.I., Samokhvalov, A.A., and Fakidov, I.G.

TITLE:

Anisotropy of the longitudinal thermomagnetic Nernst-Ettingshausen-effect in magnetite in the low-temperature transition region

PERIODICAL:

Fizika tverdogo tela, v. 3, no. 6, 1961, 1650 - 1653

TEXT: The crystal structure of magnetite is modified at about 120°K, and, as a consequence, all physical properties are practically changed. In connection with the theory by Verwey et al. (J. Chem. Phys. 15, 181, 1947), in which the 3d electrons are assumed to rearrange in the transition point, it is of interest to study the anisotropy of various properties of magnetite, as it may serve to verify the theory. The authors studied the anisotropy of the longitudinal thermomagnetic Nernst-Ettingshausen effect (1.th. N-E.E.) in the transverse magnetic field. A report is given of relative results. For measuring the 1.th.N-E.E., the sample was introduced into a cryostat cooled with liquid nitrogen.

Card 1/4

24903

S/181/61/003/006/002/031
B102/B201

Anisotropy of the longitudinal...

By two heaters at the sample ends, it was possible to establish any temperatures between 77 and 200°K. Two copper-constantan thermocouples served for measuring the temperature. The samples were cut from natural magnetite single crystals and had a cylindrical shape (3 mm in diameter, 10-15 mm long) with the axis parallel to the [110] direction (the orientation was checked roentgenographically). Temperature gradient and direction of the measurement of the 1.th.N-E.E. likewise coincided with the [110] direction. The constant magnetic field of 20,400 oe was in the (110) plane, perpendicular to [110]. During the measurement of the 1.th.N-E.E. the samples were rotated about the axis by 360°, first in one, then in the opposite direction, and a measurement was made every 10°. The mean values were then calculated from four measured values at each point. The anisotropy of the 1.th.N-E.E. was measured on five samples in the 90 - 160°K range. Fig. 1 presents the 1.th.N-E.E. as a function of the orientation of the magnetization vector with respect to the [001] direction; the relative change of the thermo-emf in the magnetic field, which is related to the value of the 1.th.N-E.E. by the relation $\Delta\alpha/\alpha = E_{N-E.}/(\alpha\Delta T/\Delta x)$, is taken as the ordinate. The study

Card 2/4

24905

S/181/61/003/006/002/031
B102/B201

Anisotropy of the longitudinal....

yielded the following results: 1) If the magnetite is cooled below the transition point, not only the value of the 1.th.N-E.E. changes, but to a high degree also the character of anisotropy. If the magnetic field is parallel to the $[1\bar{1}0]$ direction, a maximum change of the effect will be observed both above and below the transition region. 2) The 1.th. N-E.E. has, below the transition point, and if the magnetic field is applied in parallel to the $[110]$ direction, a considerable value to which corresponds a diminution of the thermo-emf in the magnetic field by 14 %. 3) The irreversible part of the first anisotropy curve that may be observed with samples cooled down to liquid-nitrogen temperatures without magnetic field, is connected with the irreversible re-orientation of the orthorhombic c-axes of the various domains in the strong magnetic field. There are 2 figures and 10 references: 1 Soviet-bloc, and 9 non-Soviet-bloc. The three most important references to English-language publications read as follows: S.C.Abrahams, V.A.Calhoun. Acta Cryst. 8, 257, 1955; W.C.Hamilton. Phys. Rev. 110, 1050, 1958; C.A.Domenicali. Phys. Rev. 78, 458, 1950.

Card 3/4

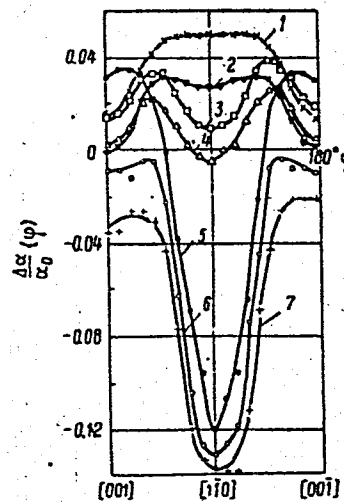
Anisotropy of the longitudinal....

S/181/61/003/006/002/031
B102/B201

ASSOCIATION: Institut fiziki metallov AN SSSR Sverdlovsk (Institute
of Physics of Metals AS USSR Sverdlovsk)

SUBMITTED: December 12, 1960

Legend to Fig. 1: 1) 124°K,
2) 113,
3) 110,
4) 108,
5) 96,
6) 92,
7) 91°K.



Card 4/4

24746

S/191/61/000/007/004/010
B101/B215

15-8020

AUTHORS: Antropova, N. I., Vlasova, K. N., Pavlova, G. I.,
Samokhvalov, A. V., Sharova, A. V.

TITLE: High-molecular polycaproatamide

PERIODICAL: Plasticheskiye massy, no. 7, 1961, 17-19

TEXT: At present, polycaproatamide is synthesized in industry by hydrolytic polymerization. The process takes 16-18 hr at 250°C. The polymer has an intrinsic viscosity of 0.6-0.8 and contains 10-12 % of substances soluble in water. The polymerization of caprolactam in the presence of alkaline catalysts was studied on the basis of western publications. The authors aimed at stabilizing the viscosity of the polymer. 1) Polymerization in the presence of metallic sodium or KOH (US Patent 2251519 (1941)). In the presence of these catalysts, commercial caprolactam polymerizes at 220°C. The reaction is exothermic and takes no more than 10-15 min. A 0.5 % solution of the obtained polymers in tricresol had an intrinsic viscosity of 1.8-3.0. The impact strength varied between 80 and

Card 1/4

High-molecular polycaproamide

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S/191/61/000/007/004/010
B101/B215

133 kg·cm/cm², and the Brinell hardness between 7.8 and 13.5. After casting under pressure, the impact strength was reduced. The polymers were thermally unstable, and their intrinsic viscosity during heating was reduced to 250-260°C. Stabilization according to the patent was not successful. The granulated polymers were therefore treated with dilute mineral acid (dilute acetic acid showed no stabilizing effect) and washed. After heating up to 250-260°C subsequent polycondensation and formation of a network occurred. To eliminate the action of the residual mineral acid, the granules were treated with dilute NH₃. After that, the intrinsic viscosity of the polycaproamide heated up to 250-260°C remained stable for 4-6 hr (0.81). This polymer was suited for extruding and other processes. Now, the impact strength was 125-155 and the Brinell hardness 12.7-15.2. A unit for continuous production of 4 kg of polycaproamide per hr was designed. 2) On the basis of papers by O. Wichterle, Sebenda et al. (Makromol. Chem. 35, 174, (1960) Czechoslovakian Patent 93016 (1957)), acetyl caprolactam (ACL) was used as a co-catalyst besides Na or KOH. The physico-mechanical properties of the polymers depended upon the ratio of the catalyst components. With KOH/ACL=2:1 the intrinsic viscosity was 2.07-3.1, the impact strength 150-160, and the Brinell hardness 24.0-26.0.

Card 2/4

24746

S/191/61/000/007/004/010
B101/E215

High-molecular polycapromide

For KOH/ACL = 1:1 the corresponding values are 1.3-2.05, 100-125, 15-17, respectively; for KOH/ACL = 2:3: 0.9-1.1, 86-96, 9-10. For Na/ACL = 2:1: intrinsic viscosity 2.11-3.36; impact strength 110-160; Brinell hardness 24-26.6; and for Na/ACL = 1:1: 2.19-2.23, 125-135, 11.0-17.0. Polymerization was conducted in molds of aluminum, galvanized iron, stainless steel, or aluminum foil. Stainless steel proved to be most suitable. Cogwheels very resistant to abrasion were made from polymers by mechanical processing. In the presence of reinforcing material such as metal plates (Al, Fe, Cu, and steel), graphite, molybdenum sulfide, ceramics, microlite, fluoroplast-4, 45-50 % glass fiber or glass fabric, the course of polymerization was normal and the metal inserts in the ready-made block were well fixed due to considerable shrinkage (5 %). 3) On the basis of a paper by S. Chrzczonowicz (Makromol. Chem., 38, 159 (1960), Polish Patent 41536 (1958)) the polymerization of caprolactam was examined in the presence of Na and CO₂. Also in this case, the polymerization took place below the melting point of the polymer. Time of reaction: 35-60 min; yield of the polymer: 85-90 %; viscosity: 2.0-4.5; melting point: 215-225°C; impact strength: 140-165; Brinell hardness: 15.5-22.5. The polymer differed largely from that obtained by ACL addition. There are 3 tables

Card 3/4

24746

S/191/61/000/007/004/010
B101/B215

High-molecular polycaproamide

and 5 references: 3 Soviet-bloc and 2 non-Soviet-bloc.

Card 4/4

32072

S/181/61/003/012/006/028

B102/B108

15-2650

AUTHOR: Samokhvalov, A. A.

TITLE: Dielectric properties at superhigh frequencies of a group of oxides of 3d transition metals

PERIODICAL: Fizika tverdogo tela, v. 3, no. 12, 1961, 3593 - 3601

TEXT: The shf dielectric properties of Ti_2O_3 , V_2O_3 , Cr_2O_3 , Mn_2O_3 , $\alpha-Fe_2O_3$, TiO , VO , MnO , MnO_2 , FeO , CoO , NiO , and MnS were studied. The static complex dielectric constant was measured at $9.5 \cdot 10^9$ cps. Some of the oxides investigated were supplied by the Institut metallurgii UFAN (Institute of Metallurgy UFAN). The specimens were prepared from oxide powder ($\leq 50\mu$) with paraffin, or the powder was pressed and sintered. The oxide content of the paraffin samples did not exceed 18 - 20% by volume. The dielectric constant $\epsilon^* = \epsilon' + i\epsilon''$ was determined from the phase shift δ in a coaxial line and the half-width $\Delta\lambda$ of the standing-wave minimum: $\epsilon' = 1 + \delta/d$, $\epsilon'' = \Delta\lambda/2d$; d = sample thickness. For the paraffin mixture, ϵ was determined from $\epsilon_{mix}^k = v_1 \epsilon_1^k + (1 - v_1) \epsilon_2^k$. The subscript 1 refers to the oxide

Card 1/3

Dielectric properties at...

32072
S/181/61/003/012/006/028
B102/B108

mixture (v_1 - its volume content), 2 to the paraffin. The errors in the determination of ϵ' and ϵ'' were 4 - 10 and 10 - 30%, respectively. The spread of the measured $\epsilon(T)$ values was about 0.3 - 0.4%, which is low enough to study the anomalies of the curves. The following values of ϵ' were measured: 12.8 (MnO), 12.7 (FeO), 10.0 (CoO), 9.7 (NiO), 30 (Ti_2O_3), 18 ($\text{V}_2\text{O}_{3.07}$), 8 (Cr_2O_3 , Mn_2O_3), 12 ($\alpha\text{-Fe}_2\text{O}_3$). For $\text{V}_2\text{O}_{3.07}$, ϵ' was measured also for $T > \theta_{\text{trans}}$, where it was 36. The temperature dependences of $\Delta\epsilon'/\epsilon'$ and $\Delta\epsilon''/\epsilon''$ showed steps near the Néel temperature θ_N in some cases, e. g. for Cr_2O_3 ($\frac{\Delta\epsilon'}{\epsilon'} = \frac{\epsilon'_T - \epsilon'_{\theta_N}}{\epsilon'_{\theta_N}}$). $\text{V}_2\text{O}_{3.07}$ showed a jump of $\Delta\epsilon'/\epsilon'$ at the point of phase transition ($\sim 160^\circ\text{K}$). $\ln \sigma_{\text{shf}} = f(1/T)$ consists of two straight lines, interconnected by a jump at 160°K . From their inclinations, the activation energies were determined: 0.04 ± 0.01 above and 0.17 ± 0.02 eV below the transition point; $\Delta\epsilon \sim 1/\epsilon^2$; $\sigma_{\text{shf}} = 1.8 \cdot 10^{-2} \text{ ohm}^{-1} \text{ cm}^{-1}$ at room temperature. For Ti_2O_3 $\epsilon''(T)$ has a maximum at 225°K , which entails a

Card 2/3

Dielectric properties at...

32072
S/181/61/003/012/006/028
B102/B108

minimum of ϵ'' , and which is due to the fact that $\omega = \tau^{-1}$. FeO shows a similar behavior at 180°K, and at 200°K (θ_N). A similar anomaly of $\Delta\epsilon'/\epsilon'$ was observed in MnS at 140 - 160°K (θ_N). α -Fe₂O₃ had a slight anomaly of $\Delta\epsilon'/\epsilon'$ at -200°C. ϵ' of MnO₂ was almost constant between -100 and -10°C, had a minimum at 48°C, increased a little, and then remained constant up to 100°C. At room temperature, $\epsilon' = 15$. I. G. Fakidov is thanked for interest. There are 4 figures, 2 tables, and 21 references: 13 Soviet and 8 non-Soviet. The four most recent references to English-language publications read as follows: F. I. Morin, Bell Syst. Techn. Journ., 37, 1047, 1958; G. Shirane, S. I. Pickart, R. Newnham. Phys. Chem. Sol., 13, 1, 2, 166, 1960; P. H. Carr, S. Foner. J. Appl. Phys., 13, 5, 344, 3, 1960; S. Van Houten. Phys. Chem. Sol., 17, 1, 2, 7, 1960.

ASSOCIATION: Institut fiziki metallov AN SSSR Sverdlovsk (Institute of Physics of Metals AS USSR, Sverdlovsk) X

SUBMITTED: June 28, 1961

Card 3/3

43785

21.6000

AUTHOR: Samokhvalov, A. A. and Fakidov, I. G.

S/263/62/000/016/002/002
I011/I242

TITLE: The use of photo-elements in combination with phosphors for the recording of betatron as well as gamma and X-ray radiation

PERIODICAL: Referativnyy zhurnal, Otdel'nyy vypusk. 32. Izmeritel'naya tekhnika, no. 16, 1962, 64, abstract 32.16.534. In collection: Betatromaya gamma-defektoskopiya stali. M., AN SSSR, 1961, 52-55

TEXT: The results of research on the use of photo-elements (F) in contact with phosphors, for the recording of betatron as well as γ - and X-ray radiations are given. A selenium F of the ЛЭТИ (LETI) type and a vacuum F were used. A galvanometer of a 5×10^{-10} A/mm·m sensitivity was used for recording of the F currents. Caesium iodide, potassium iodide (both activated by thallium), stilbene, naphtaline, tolane served as phosphors. On the basis of recording results of betatron radiation energy up to 22 MeV, γ -radiation of Co^{60} and X-ray radiation energy of 30 kev it was shown that a selenium or vacuum F, in combination with a phosphor, can serve as a monitor of medium and high intensity radiation. The sensitivity of such a detector does not depend strongly on the radiation hardness and, within an order of magnitude, equals 10^{-8} A/min for a selenium F with phosphor and 10^{10} A/min for a vacuum F with phosphor.

[Abstracter's note: Complete translation.]

Card 1/1

S/181/63/005/004/039/047
B102/B186AUTHORS: Samokhvalov, A. A., and Rustamov, A. G.

TITLE: Electrical and magnetic properties of TiO

PERIODICAL: Fizika tverdogo tela, v. 5, no. 4, 1963, 1202 - 1207

TEXT: In order to obtain details on the TiO electron spectrum, conduction mechanism and magnetism, the conductivity (σ), Hall effect, thermo-emf (α), $\sigma(H)$, and the susceptibility χ were measured in the range from 80 to 400°K. TiO is characterized by a particular tendency of its wave functions to overlap, which is more pronounced than in the other oxides of this group; TiO also has the highest σ of all the 3d-oxides. The specimens investigated were synthesized from pure Ti and TiO₂ according the reaction $Ti + TiO_2 = 2TiO$, their deviation from stoichiometry being less than 1%. The electrical properties were determined by means of the common d-c compensation methods, χ was measured gravimetrically. The following results were obtained: resistivity increases with T up to about 300°K almost linearly and then a tendency to saturation becomes apparent. α is negative (n-type), for $T > 260^\circ K$ it increases linearly with T; at room temperature it amounts to

Card 1/2

Electrical and magnetic...

S/181/63/005/004/039/047
B102/B186

5 $\mu\text{V}/\text{deg}$; below 200°K α increases, i.e. $\alpha(T)$ has a broad minimum at $\sim 200^\circ\text{K}$. The Hall effect is independent of temperature (error 5-8%) in the range investigated and equal to $-1.94 \cdot 10^{22} \text{ cm}^{-3}$. The effect of a magnetic field (18 koe) on σ was less than $7 \cdot 10^{-5}$. χ was temperature-independent and equal to $(2.3 \pm 0.3) \cdot 10^{-6} \text{ CGSM/g}$. The results indicate that TiO has the electrical properties of a metal and the magnetic properties of a polarization paramagnetic. There are 6 figures and 1 table.

ASSOCIATION: Institut fiziki metallov AN SSSR Sverdlovsk (Institute of the Physics of Metals AS USSR, Sverdlovsk)

SUBMITTED: August 21, 1962 (initially)
December 14, 1962 (after revision)

Card 2/2

S/181/63/005/004/008/047
B102/B186

AUTHORS: Rustamov, A. G., Samokhvalov, A. A., and Fakidov, I. G.

TITLE: Electrical properties of nickel-zinc ferrites

PERIODICAL: Fizika tverdogo tela, v. 5, no. 4, 1963, 1031 - 1039

TEXT: With the aim of explaining the electrical conduction mechanism, the electron energy spectrum and the interrelation between electrical and magnetic properties of complex 3d-oxides, the authors investigated conductivity, shf dielectric constants, thermo-emf, Hall effect, the magnetic field effect on the electrical resistance, the saturation magnetization and the paramagnetic susceptibilities of the ferrites $\text{Ni}_x\text{Zn}_{1-x}\text{Fe}_2\text{O}_4$ ($0 \leq x \leq 1$) as dependent on x and on temperature. The compositions were so chosen that the Fe^{2+} ion concentration could be considered as constant ($2 \cdot 10^{20} \text{ cm}^{-3}$). An analysis of the results and a comparison with corresponding results of other authors shows that several conduction mechanisms are possible for the groups of elementary and complex 3d-oxides. For Zn-ferrites with $\text{ZnO}:\text{Fe}_2\text{O}_3 = 50 : 50$ and similar compositions the $\mu_e(T)$ dependence indicates band

Card 1/2

Electrical properties of...

S/181/63/005/004/008/047
B102/B186

mechanism of conductivity and ferrites with high nickel concentrations up to nickel ferrite show a skip effect type mechanism. From Hall effect and resistivity measurements the electron concentration and the mobility was determined. The concentration was found to be between 10^{17} and 10^{19} cm^{-3} and the mobility between 10^{-1} and 10^{-3} $\text{cm}^2/\text{v}\cdot\text{sec}$. There are 10 figures and 4 tables.

ASSOCIATION: Institut fiziki metallov AN SSSR Sverdlovsk (Institute of the Physics of Metals AS USSR, Sverdlovsk)

SUBMITTED: October 19, 1962

Card 2/2

RUSTAMOV, A.G.; SAMOKHVALOV, A.A.; FAKIDOV, I.G.

Electric properties of nickel-zinc ferrates. Fiz.tver.tela 5
no.4:1031-1039 Ap '63. (MIRA 16:4)

1. Institut fiziki metallov AN SSSR, Sverdlovsk.
(Ferrates--Electric properties)

SAMOKHVALOV, A.A.; RUSTAMOV, A.G.

Electric and magnetic properties of TiO . Fiz.tver.tela 5
no.4:1202-1207 Ap '63. (MIRA 16:4)

1. Institut fiziki metallov AN SSSR, Sverdlovsk.
(Titanium oxide—Electric properties)
(Titanium oxide—Magnetic properties)

ACCESSION NR: AP4028415

S/0181/64/006/004/0969/0973

AUTHORS: Samokhvalov, A. A.; Rustamov, A. G.

TITLE: The electrical properties of highly resistant nickel zinc ferrites

SOURCE: Fizika tverdogo tela, v. 6, no. 4, 1964, 969-973

TOPIC TAGS: electric property, ferrite, electric conductivity, thermoelectromotive force, Hall effect, reluctance

ABSTRACT: The authors measured the electrical conductivity, thermoelectromotive force, Hall effect, and reluctance of highly resistant nickel-zinc ferrites

($\rho \sim 10^{10}$ ohm cm) as a means of studying the mechanism of conductivity and to explain the electron energy spectrum. The results of the measurements show that the studied ferrites, being p-type semiconductors, have drift mobilities of the holes (equal to about 10^{-3} cm²/v sec at 50C) that decline with increase in temperature, reach a minimum, and then begin to increase. The Hall mobility, determined in a narrow temperature interval near room temperature, also declines with increase in temperature. Its value is one or two orders greater than the drift mobility. These results are in agreement with the existing theory on low mobility of current carriers. The possibility that the normal Hall constant may be very near or larger

Card 1/2

ACCESSION NR: AP4028415

than the ferromagnetic Hall constant follows from the theory of the Hall effect in ferromagnetic semiconductors. This relationship obtains when the mobility of the current carriers is about (or greater) than $0.1 \text{ cm}^2/\text{v sec}$. "The authors express their thanks to I. G. Fakidov for his attention to the work and for his discussion of the results, and they also thank A. A. Shvarts and A. A. Obukhov for their assistance in performing the work." Orig. art. has: 5 figures, 1 table, and 3 formulas.

ASSOCIATION: Institut fiziki metallov AN SSSR, Sverdlovsk (Institute of Physics of Metals, AN SSSR)

SUBMITTED: 16Feb63

ENCL: 00

SUB CODE: EC

NO REF SOV: 011

OTHER: 005

Card 2/2

L 25078-65 EWT(1)/EWT(m)/T/EWP(t)/EED-2/EWP(b) IJR(c) JD

ACCESSION NR: AP5003452

U/0181/65/007/001/0283/0285

AUTHORS: Samokhvalov, A. A.; Men', A. N.

TITLE: Concerning the energy spectrum of the Fe^{2+} ion in connection with the electric conductivity of ferrite-spinels

SOURCE: Fizika tverdogo tela, v. 7, no. 1, 1965, 283-285

TOPIC TAGS: ferrite, spinel, electric conductivity, energy spectrum, iron

ABSTRACT: To explain the nature of the energy gap observed in ferrite-spinels between the ground (nonconducting) and excited (conducting) levels, amounting to 0.01--0.02 eV, the authors have calculated the level scheme of the divalent ion of iron placed in the octahedral site 16(d) of spinel, with account of the spin-orbit interaction. The calculations are based on an earlier paper by one of the authors (Men', with V. I. Cherepanov, FTT v. 5, 1630, 1963),

Card

1/2

L 25078-65

ACCESSION NR: AP5003452

and when the interaction of the terms is neglected, the value obtained for the gap is ≈ 0.01 eV. If the repulsion of the terms is taken into account, then the gap will be dependent on the composition and structure of the host lattice. Although the gap has been experimentally shown to increase noticeably with decreasing number of divalent iron ions, there are not enough data to calculate this dependence theoretically. Orig. art. has: 5 formulas.

ASSOCIATION: Institut fiziki metallov AN SSSR (Institute of Metal Physics AN SSSR); Institut metallurgii AN SSSR, Sverdlovsk (Institute of Metallurgy AN SSSR)

SUBMITTED: 28Jul64

ENCL: 00

SUB CODE: SS,EM

NR REF SOV: 002

OTHER: 005

Card 2/2

L 51542-65 EMT(1)/EED-2

ACCESSION NR: AP5010734

UR/0181/65/007/004/1198/1205

AUTHOR: Samokhvalov, A. A.; Rustamov, A. G.

TITLE: Electric properties of ferrite spinels with variable content of divalent iron ions

SOURCE: Fizika tverdogo tela, v. 7, no. 4, 1965, 1198-1205

TOPIC TAGS: ferrite, spinel, iron ion, electron spectrum, electrical conductivity, thermal emf, Hall effect, magnetoresistance

ABSTRACT: To explain the mechanism of conductivity and the electron energy spectrum in oxides of transition metals, the authors investigated the electric conductivity, thermal emf coefficient, Hall effect, magnetoresistance, and saturation magnetization of systems of nickel-ferrite and zinc-ferrite spinels containing variable amounts of divalent iron ions. The measurement procedure was described earlier (FTT v. 5, 1031, 1963). The polycrystalline sulfide samples were made from the oxides by a standard technology. The temperature range investigated was 8-700K. Plots of the measured quantities are presented. The data are used to calculate the chemical potential as a function of the temperature and concentration of the divalent iron ions. The chemical potential obtained from the thermal emf coefficient

Card 1/2

L 51542-65

ACCESSION NR: AP5010734

is in satisfactory agreement with the calculated potential. The carrier densities, and their Hall and drift mobilities as functions of the content of the iron ions and of the temperature are calculated from the experimental data. In the depletion region, the carrier density coincides with the density of the divalent iron ions in the ferrite. The Hall mobility is 1.5--2 orders of magnitude higher than the drift mobility. The drift mobility increases with increasing temperature, with an activation energy 0.10--0.20 eV. The Hall mobility can have both positive and negative temperature coefficients of mobility. "The authors thank M. I. Klinger, I. M. Tsidil'kovskiy and I. G. Fakidov for interest in the work and for a discussion of some of its results, and also Ye. A. Alekseyev for help with the measurements." Orig. art. has: 6 figures, 3 formulas, and 4 tables.

ASSOCIATION: Institut fiziki metallov AN SSSR, Sverdlovsk (Institute of Metal Physics AN SSSR)

SUBMITTED: 11 May 64

ENCL: 00

SUB CODE: SS, EM

NR REF SOV: 011

OTHER: 003

Card 2/2

L 1717-66 EPF(c)/EWT(m)/EWP(b)/T/EWP(w)/EWP(t) IJP(c) JD/JG

ACCESSION NR: AP5021944

U11/0126/65/020/002/0308/0309
539.292:538.114

AUTHOR: Samokhvalov, A. A.; Bamburov, V. G.; Volkanshteyn, N. V.; Zotov, T. D.;
Ivakin, A. A.; Morozov, YU. N.; Simonova, M. I.

TITLE: Magnetic properties of Eu_3O_4

SOURCE: Fizika metallov i metallovedeniye, v. 20, no. 2, 1965, 308-309

TOPIC TAGS: magnetization, saturation magnetization, temperature dependence, Curie temperature, Weiss-Forrer method, magnetic moment, europium compound

ABSTRACT: To elucidate the magnetic properties of Eu_3O_4 the authors measured the temperature dependence of magnetization in the presence of different magnetizing fields at temperatures of upward of 1.65°K and thus determined for the first time the principal magnetic characteristics of Eu_3O_4 : saturation magnetization σ_s and Curie temperature T_C . The measurements were performed with the aid of a pendulum magnetometer. The external magnetic field in the measurements reached 19,300 oe, which sufficed to bring the specimen to magnetic saturation. Through extrapolation from the set of curves $\sigma(H, T)$ to $H = \infty$ the saturation magnetization σ_s was found

Card 1/3

L 1717-66

ACCESSION NR: AP5021944

to be $89.4 \text{ gauss} \cdot \text{cm}^3/\text{g}$. From the same curves, using the Weiss-Forrer method of lines of equal magnetization, the authors found the Curie temperature, which proved to be 7.8°K . With its relatively large magnetic moment and low Curie point, this oxide appears a suitable means of verifying the spin-wave theory. Verification of this theory showed that the linear T^2 -dependence of saturation magnetization exists throughout a broad temperature range (from 1.65 to 4.6°K) ($0.6 T_C$). The same dependence is also observed for a number of uncompensated antiferromagnetics and for certain rare earths. Orig. art. has: 1 figure.

ASSOCIATION: Institut fiziki metallov AN SSSR (Institute of Metal Physics, AN SSSR)

SUBMITTED: 200ct64

ENCL: 01

SUB CODE: IC; EM

NO REF SOV: 000

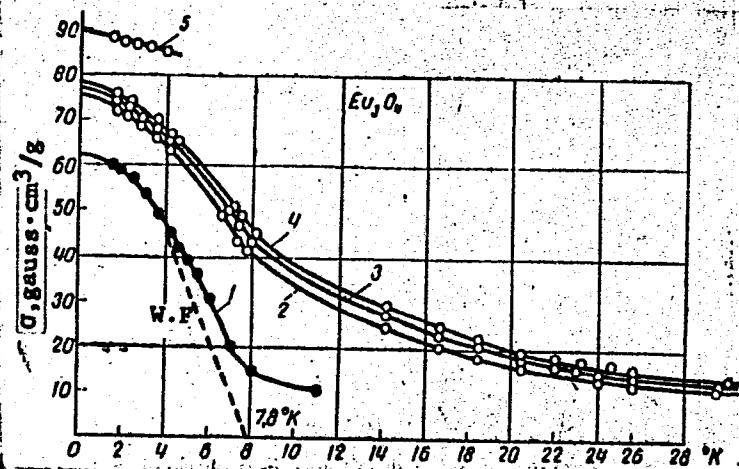
OTHER: 004

Card 2/3

L 1717-66

ACCESSION NR: AP5021944

ENCLOSURE: 01



Card 3/3

L 5327-66 EWT(1)/EWT(m)/EPF(c)/T/EWP(t)/EWP(b)/EWA(c) IJP(c)
 JD/JG/GG
 ACCESSION NR: AP5021108 UR/0056/65/049/002/0452/0455
 44.55 44.55 44.55
 AUTHORS: Sokolova, G. K.; Demchuk, K. M.; Rodionov, K. P.;
 Samokhvalov, A. A.
 TITLE: Influence of uniform compression on the Curie temperature of
 the ferromagnetic compound EuO
 SOURCE: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 49,
 no. 2, 1965, 452-455
 TOPIC TAGS: second order phase transition, europium compound, Curie
 point, ferromagnetism, crystal lattice structure
 ABSTRACT: To investigate the effect of various factors on the ex-
 change interaction in solids, and especially the dependence of the
 exchange interaction on the lattice parameters, the authors inves-
 tigated the dependence of the Curie temperature of the compound EuO
 under uniform compression at pressures up to 12,000 atm. The method
 used to determine the ferromagnetic Curie temperature of the europium
 oxide was that of L. N. Tul'chinskiy (Zavodskaya laboratoriya no. 2,

Card 1/3

0901/089

L 5327-66

ACCESSION NR: AP5021108

7
232, 1960), in which the sample is placed in one of two sections of a differential measuring coil and the Curie temperature is determined from the sharp discontinuity in the induced emf when the sample is cooled. The sample together with its measuring and magnetizing coils was placed in a high-pressure chamber, with quasi-hydrostatic high pressure applied at liquid nitrogen-temperature by the method of Ye. S. Itskevich (PTE no. 4, 148, 1963). The method of determining the Curie point from the measurements is described. The results show that in the range of pressures up to 12,000 atm the Curie temperature of EuO increases linearly with the pressure, at a rate of $(4 \pm 1) \times 10^{-4}$ deg/atm. No permanent change in the Curie temperature was observed after the removal of the high pressure. The influence of the elastic stress on the ferromagnetic transition temperature is explained by means of the thermodynamic theory of second-order phase transitions. The dependence of the Curie temperature of EuO on changes in the lattice parameters are estimated from data on the compressibility of the paramagnetic phase of EuO at room temperature. The authors thank V. G. Bamburov and A. A. Ivakin for synthesizing

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Card 2/3

L 5327-66

ACCESSION NR: AP5021108

the EuO samples, and G. A. Matveyev^{44,55} for measuring the compressibility;
Orig. art. has: 2 figures and 2 formulas.

ASSOCIATION: Institut fiziki metallov Akademii nauk SSSR (Institute
of Metal Physics, Academy of Sciences, SSSR)

SUBMITTED: 24Mar65

ENCL: 00

SUB CODE: SS

NR REF SOV: 007

OTHER: 005

Card

3/3 ml

1-00000-01 TTBH/ANP(W)/EIR(t)/ETI IJP(c) JB/CD
 ACC NR: RUS020777 SOURCE CODE: UR/0000/66/000/000/0076/0085

ATTN: S. Smekhalov, A. A.; Rustanov, A. G.

ORG: none

TTB: Electrical properties of nickel-zinc, nickel-iron, and zinc-iron ferrites

SOURCE: Vsescyuznoye soveshchaniye po ferritam. 4th, Minsk. Fizicheskiye i fizikokhimicheskiye svoystva ferritov (Physical and physicochemical properties of ferrites); doklady soveshchaniya. Minsk, Nauka i tekhnika, 1966, 76-85

TOPIC TAGS: metallurgy, ferrite, nickel, zinc, iron, electric conductivity, Hall effect, magnetostriction, thermoelectric power

ABSTRACT: The electric and magnetic properties of three two-valent ion ferrites were investigated. These were: a nickel-iron system, $Ni_{1-x}Fe_x^{2+}Fe_2O_4$; a zinc-nickel system, $Zn_{1-x}Fe_x^{2+}Fe_2O_4$; and a nickel-zinc ferrite, $(NiO)_{1,1-x}(ZnO)_x(Fe_2O_3)_{0.9}$. The measured quantities were: electric conductivity; thermo-emf coefficient; Hall effect; magnetostriction; magnetization saturation; and the paramagnetic susceptibility as a function of composition and temperature. The temperature range was 80--500K, and the electric measurements were conducted in a constant current potentiometric apparatus. The results of the measurements were plotted against the composition x of the specimen tested as well as the temperature. From these curves it can be seen that

Card 1/2

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ACC NR: AT6023977

0

in general the thermo-emf coefficient is negative for all three ferrites. Also, the Curie point for the nickel-zinc ferrites is about 600K. All the nickel-iron ferrites investigated behaved like electron semiconductors as well as most of the nickel-zinc ferrites. Orig. art. has: 7 figures and 2 tables.

SUB CODE: 11/ SUBM DATE: 22Dec65/ ORIG REF: 010/ OTH REF: 002

26/

L 06425-67 EWT(d)/EWT(1)/EWT(m)/EWP(w)/EWP(t)/ETI

IJP(c) JD/WW/JG

ACC NR: AP6026700

SOURCE CODE: UR/0181/66/008/008/2450/2454

AUTHOR: Samokhvalov, A. A.; Bamburov, V. G.; Volkenshteyn, N. V.; Zotov, T. D.; Ivakin, A. A.; Morozov, Yu. N.; Simonova, M. I.

ORG: Institute of Metal Physics, AN SSSR, Sverdlovsk (Institut fiziki metallov AN SSSR)

TITLE: Magnetic properties of EuO at low temperatures

SOURCE: Fizika tverdogo tela, v. 8, no. 8, 1966, 2450-2454

TOPIC TAGS: europium compound, spontaneous magnetization, magnetic susceptibility

ABSTRACT: EuO was prepared by the solid-state reaction $\text{Eu}_2\text{O}_3 + \text{C} \rightarrow 2\text{EuO} + \text{CO}$, and its magnetization curves were plotted for 4.2, 20.4 and 82°K. The temperature dependence of spontaneous magnetization was measured at 1.7°K and above, and was analyzed from the standpoint of the spin-wave theory. At 4.2 and 20°K, the magnetization reaches saturation in fields slightly above 4000 Oe. The paramagnetic Curie point and the effective magnetic moment, both determined from the temperature dependence of the magnetic susceptibility, were found to be 75°K and 7.3 μ_B respectively. The exchange integral I was calculated from the low-temperature range ($T < T_c/2$) and found to be equal to 0.394k. It is shown that when the term with $T^{5/2}$ is taken into account in Bloch's law, the range of applicability of Bloch's law expands, but the value of coefficient C_1 at $T^{5/2}$, determined experimentally and giving the best agreement with the experi-

Card 1/2

L 06425-67

ACC NR: AP6026700

mental spontaneous magnetization curve, differs markedly from the calculated value.
Orig. art. has: 4 figures, 1 table and 3 formulas.

SUB CODE: 20/ SUBM DATE: 10Nov65/ ORIG REF: 002/ OTH REF: 005

Card 2/2

ANTROPOVA, N.I.; VLASOVA, K.N.; PAVLOVA, G.I.; ~~SAMOKHVALOV, A.V.~~; SHAROVA, A.V.

High molecular weight polycaproamide. Plast.massy no.7:17-19
'61. (MIRA 14:7)

(Hexanamide)

BELYY, V.A.; VLASOVA, K.N.; ANTROPOVA, N.I.; RUTTO, R.A.; KESTEL'MAN, V.N.;
LOSEV, V.P.; DERVOYED, N.A.; SAMOKHVALOV, A.V.

"Sagorlan," the new material for antifriction coatings. Plast.massy
no.6:48-50 '65. (MIRA 18:8)

S/191/63/000/001/004/017
B101/B186

AUTHORS: Vlasova, K. N., Antropova, N. I., Akutin, M. S.,
Samokhvalov, A. V., Sharova, A. V.

TITLE: Caprolon

PERIODICAL: Plasticheskiye massy, no. 1, 1963, 18-19

TEXT: Large machine parts ranging up to 600 mm diameter and 50 kg weight were experimentally produced at NIIPM by polymerizing caprolactam. Sodium metal, K_2O , or Na_2O were used as initiators, and acetyl caprolactam, benzoyl chloride, CO_2 , etc., as activators. These plastics, caprolon E(B) and caprolon C(S), have the following properties: density 1.15-1.16 g/cm³; impact strength 110-160 kg·cm/cm²; bending strength 1250-1500 kg/cm²; elastic modulus in tension 20,000-23,000 kg/cm²; Brinell hardness 20-26 kg/mm²; water absorption in 24 hrs 1.5-2.0%; intrinsic viscosity 2.0-2.5; content of water-soluble substances 5-8%; shrinkage in polymerization 4-5%. Caprolon gears bearing bushings for machine tools, and engine gear units have been tested, some of them for 10-18 months. Attempts are

Card 1/2

Caprolon

S/191/63/000/C01/004/017
B101/B186

being made to produce specimens of 2 m diameter and to produce
caprolon by a continuous process. There is 1 figure. ✓

Card 2/2

S/191/63/000/001/004/017
B101/B186

AUTHORS: Vlasova, K. N., Antropova, N. I., Akutin, M. S.,
Samokhvalov, A. V., Sharova, A. V.

TITLE: Caprolon

PERIODICAL: Plasticheskiye massy, no. 1, 1963, 18-19

TEXT: Large machine parts ranging up to 600 mm diameter and 50 kg weight were experimentally produced at NIIPM by polymerizing caprolactam. Sodium metal, K_2O , or Na_2O were used as initiators, and acetyl caprolactam, benzoyl chloride, CO_2 , etc., as activators. These plastics, caprolon B(B) and caprolon C(S), have the following properties: density 1.15-1.16 g/cm³; impact strength 110-160 kg·cm/cm²; bending strength 1250-1500 kg/cm²; elastic modulus in tension 20,000-23,000 kg/cm²; Brinell hardness 20-26 kg/mm²; water absorption in 24 hrs 1.5-2.0%; intrinsic viscosity 2.0-2.5; content of water-soluble substances 5-8%; shrinkage in polymerization 4-5%. Caprolon gears bearing bushings for machine tools, and engine gear units have been tested, some of them for 10-18 months. Attempts are
Card 1/2

Caprolon

S/191/63/000/001/004/017
B101/B186

being made to produce specimens of 2 m diameter and to produce
caprolon by a continuous process. There is 1 figure.

Card 2/2

ANTROPOVA, N.I.; VLASOVA, K.N.; PAVLOVA, G.I.; SAMOKHVALOV, A.V.; SHAROVA,
A.V.; PARLASHKEVICH, N.Ya.

Study of the anion polymerization of epsilon-caprolactam by the
changes in the melt resistance. Plast. massy no.1:12-14 '65.
(MIRA 18:4)

SAMOKHVALOV, A.V.; BERG, Yu.N.; LIVSHIN, A.M.; MARKINA, Ye.A. [Markina, Ye.A.]; KRYMSKAYA, B.M. [Kryms'ka, B.M.]

Fractional composition of water soluble neuroglia proteins.
Ukr. biokhim. zhur. 37 no.4:510-521 '65. (MIRA 18:9)

1. Kafedra biokhimii Leningradskogo pediatricheskogo meditsinskogo instituta.

ACCESSION NR: AP5012433

PC-4/PE-5/PR-4/PS-4 WH/JAJ/RW
UR/0374/65/000/002/0118/0122
678:620.169

AUTHORS: Stinskas, A. V. (Moscow); Antropova, N. I. (Moscow); Korobov, V. I. (Moscow); Ratner, S. B. (Moscow); Samokhvalov, A. V. (Moscow); Sharova, A. V. (Moscow)

TITLE: On fatigue properties of capron and caprolon

SOURCE: Mekhanika polimerov, no. 2, 1965, 118-122

TOPIC TAGS: capron, fatigue strength, caprolon, polymer, plastic

ABSTRACT: The purpose of the investigation was to test the fatigue properties of two important thermoplastics which find wide application in the machine industry, i.e., capron and caprolon. Two varieties of caprolon were investigated: (A) - polymerized in presence of sodiumcaprolactam and acetic anhydride; (B) - ~~polymerized~~ in the presence of sodiumcaprolactam and carbon dioxide. Both varieties were compared with capron B₀. The fatigue properties were determined at console frequency of 100 cycles/min at 20°C and at the temperature of self-heating. It was found that both caprolons had identical fatigue properties, and on the basis of 10^6 cycles both caprolons had a 70%, i.e., 300 kg/cm² greater fatigue strength than capron B₀.

L 61462-65

ACCESSION NR: AP5012433

strength than capron "B". The results of self-heating experiments are in complete agreement with those of S. B. Ranter and V. I. Korctov (Mekh. pol., 1965 (v. pechati)). The critical self-heating temperature for caprolon at 290 kg/cm² load and for capron at 165 kg/cm² load was found to be ΔT_c 15C. The specimens undergo rapid destruction after reaching the critical temperature. The critical temperature was found to have a definite value and was independent of the load, the frequency, and heat removal. It is concluded that heat removal leads to an increase in the fatigue strength of both plastics. The fatigue strength of a caprolon specimen cooled by an air stream exhibited a 22% increase in fatigue strength. Orig. art. has: 2 tables and 3 graphs.

ASSOCIATION: none

SUBMITTED: 120ct64

ENCL: 00

SUB CODE: MT

NO REF SOV: 007

OTHER: 000

Card 2/2

SAMOKHVALOV, B.V., inzh.

Recording dynamometer for registering characteristics of panto-
graphs. Elek. i tepl. tiaga 4 no. 2:24 F '60. (MIRA 13'6)
(Electric current collectors)
(Dynamometer)

SAMOKHVALOV, D.A.

Navigation Sextant with Gyroscopic Horizon: by D. Samokhvalov.

"Merchant Fleet", Issue No 2 (Feb '52)

GRIGOR'YEV, V.V.; SAMOKHVALOV, D.A.; TSURBAN, A.I.; SHCHETININA, A.I.
kapitan, redaktor, PIRESON, M.M., tekhnicheskiy redaktor.

[Nautical instruments] Morekhodnye instrumenty. Pod obshchei
red. A.I.Shchetininoi. Leningrad, Izd-vo "Morskoi transport,"
1955. 382 p. (MLRA 9:1)
(Nautical instruments)

GRIGOR'YEV, Vladimir Vasil'yevich; SAMOKHVALOV, Dmitriy Arkad'yevich;
TSURBAN, Appolon Ivanovich; SHCHETININA, Anna Ivanovna; Kapitan
dal'nego plavaniya; SERKO, G.S., red.; TIKHONOVA, Ye.A.,
tekhn.red.

[Nautical instruments] Morekhodnye pribory i instrumenty.
Izd.2., perer. i dop. Pod obshchei red. A.I.Shchetininoi.
Moskva, Izd-vo "Morskoi transport," 1960. 427 p. (MIRA 14:3)

(Nautical instruments)

SAMOKHVALOV, G.

Jack of all trades... Sov.profsoiuzy 18 no.23:24-25 D '62.
(MIRA 15:12)

1. Predsedatel' komiteta professional'nogo soyuza pryadil'no-
tkatskoy fabriki, g. Frunze, Kirgizskaya SSR.
(Frunze—Textile workers)
(Trade unions—Officers)

SAMOKHVALOV, G. I., SIBIRTSEVA, V. YE., GENKIN, YE. I., PRECHAZHENSKIY, N. A.

Methyltetradecanoic Acid

Synthesis of 14-methoxy-3-methyltetradecanoic acid and its analogs, initial substances for the preparation of macrocyclic ketones and lactones. Dokl. AN SSSR 84 No. 4, 1952.

Monthly List of Russian Accessions, Library of Congress, October 1952. Unclassified.

SAMOKHVALOV, G. I., MIROPOL'SKAYA, M. A., VAKULOVA, L. A., PREOPRAZHENSKAYA, N. A.

Geraniol

Complete synthesis of pseudo-ionone, ionenes, geraniol, and nerol. Dokl. AN SSSR, 84, No. 6, 1952.

9. Monthly List of Russian Accessions, Library of Congress, October 195~~7~~₂, Uncl.

Samokhvalov, G. I.

Chemical investigations in the field of vitamin A. I. Structure of the condensation products of β -ionone with γ -bromocrotonic acid esters by the Reformatskii reaction. G. I. Samokhvalov, M. A. Miropol'skaya, L. A. Vuklova, and N. A. Preobrazhenskii. *Trudy, Vsesoyuz. Nauch.-Issledovatel. Vitamin. Inst.* 4, 5-10 (1953). —The Reformatskii reaction of β -ionone (n_D^{20} 1.5192; purified through semicarbazone, m. 148°) and $\text{BrCH}_2\text{CHCO}_2\text{R}$ in the course of the Dorp and Arens synthesis of vitamin A proceeds through $\text{R}'\text{CH}:\text{CHCMe}(\text{OZnBr})\text{CH}_2\text{CH}:\text{CHCO}_2\text{R}$ (I), where $\text{R}' = 0,6$ -dimethyl-1-cyclohexen-1-yl, which is readily decomposed to $\text{R}'\text{CH}:\text{CHCMe}:\text{CHCH}:\text{CHCO}_2\text{R}$ (II). On standing, the C_6H_8 soln. yields a yellow-green ppt. consisting of an org. complex contg. Zn (Zn 31.7, Br 38.4, and the org. residue 19.2%, resp.) which polymerizes on vacuum distn. I treated with dil. AcOH hydrolyzes to an ester (IV) which saponif. to II ($\text{R} = \text{Me}$), m. 161.5-2.5°, absorption max. 324 m μ by chromatography through an Al_2O_3 column was shown to be nonhomogenous. II. Synthetic reactions in the field

of polyenic compounds with the aid of metal organic derivatives of alkoxyvinyl acetylenes. G. I. Samokhvalov, I. A. Rabinov, M. A. Miropol'skaya, and N. A. Preobrazhenskii. *Ibid.* 10-13. —By the method by A. A. Petrov (C.A. 35, 3593) $\text{RCH}_2\text{CH}:\text{CMeCHO}$ (I) ($\text{R} = \text{Me}, \text{C}_6\text{H}_5$,

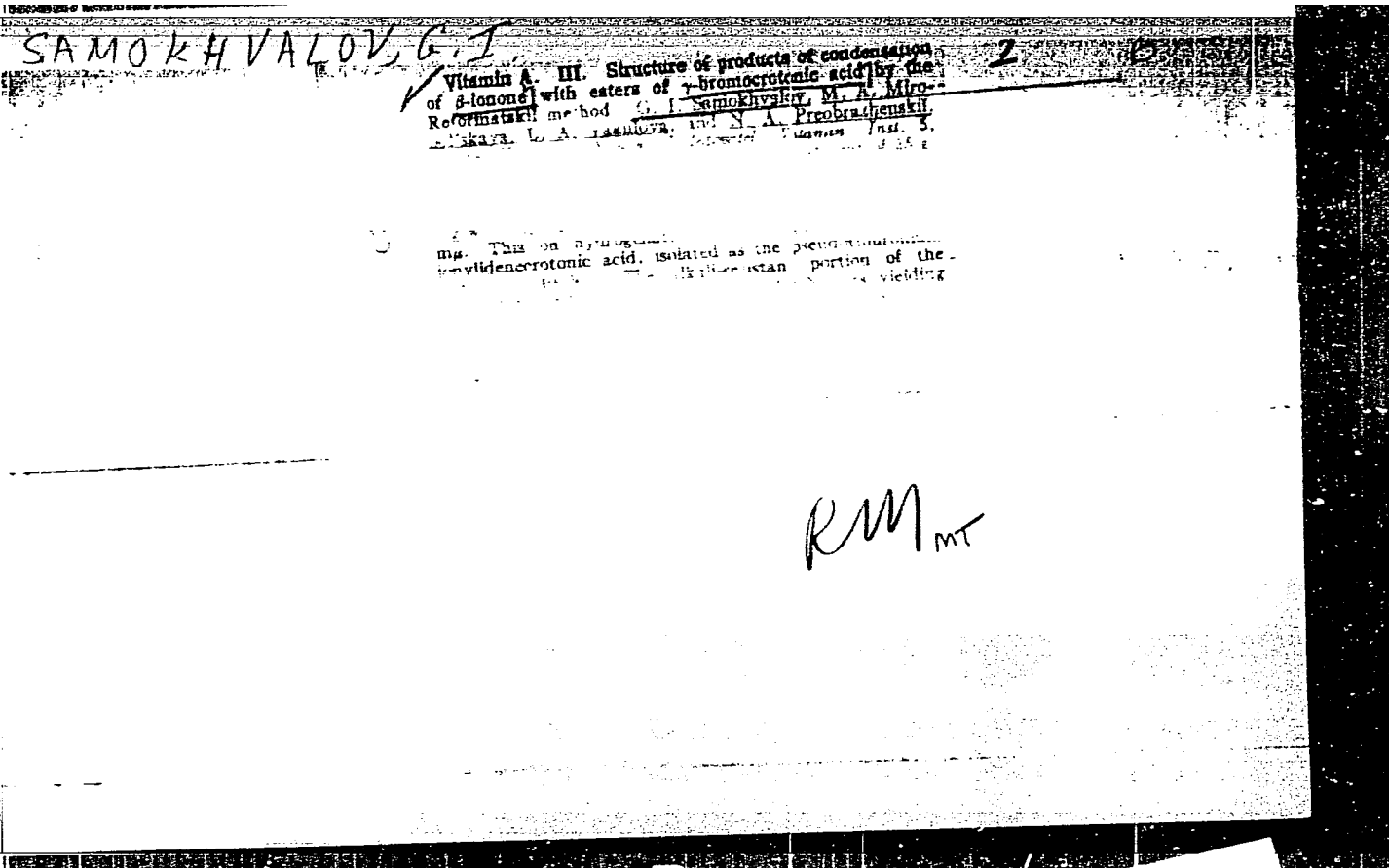
$\text{CH}_2\text{CH}_2\text{CMe}:\text{C}-$) was condensed with $\text{LiC}:\text{CC}(\text{OEt})_2$

CH_2 (III) to give $\text{RCH}_2\text{CH}:\text{CMeCH}(\text{OH})\text{C}:\text{CC}(\text{OEt})_2$ (III) which with 1% H_2SO_4 in alc. yielded $\text{RCH}:\text{CHCMe}:\text{CHC}:\text{CAc}$ (IV); semicarbazone, m. 200-1°. The conjugated system of the unsatd. bonds of IV is shown by a characteristic ultraviolet absorption max. at 334 m μ ($\log \epsilon = 4.17$). Upon hydrogenation of the acetylenic group of IV the compd. $\text{RCH}:\text{CHCMe}:\text{CHCH}:\text{CHAc}$ (V) was obtained which was used for the synthesis of vitamin A (VI) by treatment with $\text{BrMgC}:\text{COEt}$ to give $\text{RCH}:\text{CHCMe}:\text{CHCH}:\text{CHCMe}(\text{OH})\text{C}:\text{COEt}$ from which was prepd. $\text{RCH}:\text{CHCMe}:\text{CHCH}:\text{CHCMe}:\text{CHCO}_2\text{Et}$ (VII). LiAlH_4 reduction of VII gave VI. The mechanism of the reaction of polyenic carbonyl compds. with metal-org. derivs. of alkoxyvinylacetylenes to form new polyenic conjugated carbonyl compds. is discussed. E. Wierbicki

SAHOKHVALOV, G.I.; MIROPOL'SKAYA, M.A.; VAKULOVA, L.A.; PREOBRAZHENSKIY,
N.A.

Chemical research in the field of vitamin A. Report No. 2.
Structure of the condensation products of β -ionone with esters
of γ -bromocrotonic acid according to Reformatskii. Trudy VNIVI 5
5-10 '54. (MLRA 9:3)

1. Sinteticheskaya laboratoriya.
(IONONE) (CROTONIC ACID)



SAMOKHVALOV, GL. I.

Category : USSR/Optics - Spectroscopy

Abs Jour : Ref Zhur - Fizika, No 1, 1957, No 2431

Author : Slovakhova, N.A., Samokhvalov, Gl. I., Mizopol'skaya, M.A., Vakulova, L.A.,
Zhukova, L.P., Preobrazhenskiy, N.A.

Title : Spectroscopic Investigation of the Mechanism of the Reaction of the Condensation of β -ionone with Ethyl Ether of γ -Bromocrotonic Acid

Orig Pub : Izv. AN SSSR, ser. fiz., 1954, 18, No 6, 692-693

Abstract : No abstract

Institution:

Submitted :

APPROVED FOR RELEASE: 08/25/2000

CIA-RDP86-00513R001446930

...hydration
...reaction with
...rectification in
...therefrom are described.
...an unstable ester, a product
...of the intermediate hydroxyester.

SAMOKHVALOV, G.I.

62
Application of infrared spectra to the study of intermediate products in the synthesis of vitamin A and carotene. IN. A. Slorokhotova, G. I. Samokhvalov, G. M. Kunitskaya, and M. A. Mikropol'skaya. *Zhur. Obshchei Khim.* 24, 2222-30 (1964).—Reproductions of the infrared spectra of several intermediates in the synthesis of vitamin A are given. Pseudolionone (either synthetic from methylheptenone or from natural citral) shows intense triplet at 1675-1690 cm^{-1} , connected with the conjugated system; thus the 1675 band is probably caused by CO, the 1690 by the C:C bond, and 1635 by isolated olefin link. However, synthetic pseudolionone has a band at 1700 cm^{-1} , indicating the presence of $\text{Me}_2\text{C}:\text{CHCH}_2\text{CH}:\text{CMeCH}_2\text{CH}:\text{CHAc}$; the synthetic product also shows more intense 882 band in comparison with the 815 band; natural product shows equal intensity of both bands; thus the synthetic material contains more cis isomer. In 3400 band region the synthetic product shows a 3-fold greater intensity of absorption than does the product

from citral; this can be explained by partial enolization, which is apparently more readily attained in the synthetic product. Me β -ionolidenecrotonate was purified by adsorption on Al_2O_3 , followed by elution in the form of 4 successive fractions. The pure ester used as reference was prepd. from the free acid and CH_3N_3 ; this showed bands at 1700 cm^{-1} (CO in ester group), 1270, 1200, and 1170 (MeO group in the ester), as well as 1140 (1 of the modes of ester group vibration); 1040 and 1020 bands are assoc. with conjugation of the polyene chain with the ester group; the cyclohexene ring is proved by 1130, 1450, and 1650 cm^{-1} bands, the latter being masked by 1700 and 1600 bands. The spectra of the 1st 3 chromatographic fractions show a wide double max., 1700 and 1720, a shifted band at 1610, which may be attributed to isomeric structures obtained by allylic and prototropic rearrangements of the initial ester; the 4th fraction shows intense max. at 3380 (OH assoc. with H-bonds), 1700, and 1585-1600 cm^{-1} , indicating the formation of a side chain, $\text{MeO}_2\text{CCH}_2\text{CH}:\text{CHCMe}:\text{CHCH}_2$, on the cyclohexene ring. The formation of isomers can be expected in the Reformatskii method of synthesis with Zn reagent. G. M. Kosolapoff

USSR/Chemistry

Card 1/1 Pub. 22 - 23/40

Authors : Samokhvalov, G. I.; Miropol'skaya, M. A.; Vakulova, L. A.; Zhukova, L.P.; Sloookhotova, N. A.; Malyusov, V. A.; and Preobrazhenksiy, N. A.

Title : Aniontropic and prototropic regroupings during the synthesis of polyene compounds

Periodical : Dok. AN SSSR 99/2, 273-276, Nov 11, 1954

Abstract : Data on the aniontropic and prototropic regroupings, observed during the synthesis of polyene compounds, are presented. It was found that the reaction between beta-ionone and esters of gamma-bromocrotonic acid (Reformatsky reaction) results not only in the formation of hydroxy-carboxylic acid esters but also in the migration of the hydroxyl (aniontropic regrouping) toward the end of the conjugated system and consequent dehydration. The conditions under which the migration of the hydrogen (prototropic regrouping) and elongation of the chain of conjugated double bonds take place are discussed. The two tendencies of the prototropic regrouping are explained. Nine references: 3-USA; 3-USSR; 2-French and 1-Swiss (1946-1953). Graphs.

Institution : All-Union Scientific Research Vitamin Institute

Presented by : Academician I. L. Knunyants, June 25, 1954

SAMOKHVALOV, G.I.; MIROPOL'SKAYA, M.A.; VAKULOVA, L.A.; PREOBRAZHENSKIY, N.A.

Full synthesis of pseudonone. Zhur.ob.khim. 25 no.3:545-550 Mr '55
(Pseudonone) (MLBA 8:6)

SAMOKHVALOV, G. I.

7
[Illegible text block]

SAMOKHVALOV, G.I.; MIROPOL'SKAYA, M.A.; PREOBRAZHENSKIY, N.A.

Synthetic analysis of polyenic compounds. Part 10: Direction and stereochemical specificity in dehydration of 3,7-dimethyloctaen-6-ol-3-oic- (1) acid (β -oxy-, α , β -dihydrogeranic) and 5,9,-dimethyldecadien-2,8-ol-5-oic-(1) acid. Zhur. ob. khim. 26 no.10: 2793-2797 0 '56. (MIRA 11:3)

1. Vsesoyuznyy Nauchno-issledovatel'skiy vitaminnyy institut.
(Dehydration) (Esters)

SAMOKHVALOV, G. I.

Polyene compounds XI. Structure of 2-methyl-4
2,6,6-trimethylcyclohexen-1-yl-2-buten-1-yl is 11. See

192 g 3-ionone and 134 g $\text{C}_2\text{H}_5\text{CO}_2\text{Me}$

At -10° , after stirring 4 hrs. the mixt. treated with 86 g. NaOH in 575 ml. 80% MeOH, warmed to $2-6^{\circ}$ and stirred 1 hr., after which 200 ml. H_2O was added, the mixt. warmed to 20° , and extd. with Bz_2O yielding from the ext. 78.7% cyclic aldehyde, b.p. $98-104^{\circ}$ (this 1139 ml.) fractionated in a motor-parking column gave 88% pure 1-methyl-2,4,6-trimethylcyclohexen-1-yl-2,4,7-trimethyl-1-ethylisocoumarone in 155-160 mm. which refluxed in petr. ether with 15% H_2SO_4 in inert sol. gave 75% original aldehyde in purified state, b.p. $94-95^{\circ}$ at 1.5 mm. $E_{D_{25}}^{20}$ 1.16, n_D^{20} 1.4966. Treatment at $4-6^{\circ}$ for 1 hr. with 1,6-dihydroxy-2,4-dimethyl-9-(2,4,6-trimethylcyclohexen-1-yl)-2,4,7-trimethyl-1-ethylisocoumarone with 1 mm. CH_2Cl_2 and 3.9 ml. pyridine, followed at -35° with N with 1.43 g. $AcCl$ in CH_2Cl_2 , gave after standing overnight 91.5% 1-acetoxy-3,7-dimethyl-6-hydroxy-2,4,6-trimethylcyclohexen-1-yl-2,4,7-trimethyl-1-ethylisocoumarone, oil, η_D^{20} 1.5060, $E_{D_{25}}^{20}$ 1.263. This (4.5 g.) in 90 ml. EtOH treated with 22.5 ml. 5% H_2SO_4 and kept under N 3 hrs. gave after diln. with H_2O and extn. with petr. ether 80% res. only 1-acetoxy-3,7-di-

SAMOKHVALOV, G.I.; DAVYDOVA, L.P.; ZAKHARKIN, L.I.; KHORLINA, I.M.;
VAKULOVA, L.A.; ZHIKHAREVA, L.T.; PREOBRAZHENSKIY, N.A.

Synthesis studies in the field of polyene compounds. Part 17:
New synthesis of retinal or 9,13-dimethyl-7-(1,1,5-trimethyl-
cyclohexen-5-yl)-7,9,11,13-nonatetraen-15-al. Zhur.ob.khim.
30 no.6:1823-1828 Je '60. (MIRA 13:6)

1. Vsesoyuznyy nauchno-issledovatel'skiy vitaminnyy institut.
(Nonatetraenal) (Olefins)

SAMOKHVALOV, G.I.I.; MIROPOL'SKAYA, M.A.; PREOBRAZHENSKIY, N.A.

New method of synthesizing polyene ketones with conjugate double bonds. Dokl. AN SSSR 107 no.1:103-104 Mr '56. (MLRA 9:7)

1. Predstavleno akademikom I.L. Knunyantsem.
(Ketones)

SAMOKHVALOV, G. I.

Synthesis of polyenic ketones with conjugated double bonds. G. I. Samokhvalov, M. A. Miropol'skaya, and N. A. Preobrazhenskii. *Proc. Acad. Sci. U.S.S.R., Sect. Chem.* 107, 151-2 (1968) (Engl. translation: — See C.A. 50, 13820f. B. M. R.

PM

SAMOKHVALOV, G.I.

Some results of investigations on the synthesis of natural compounds;
on Prof. N.A. Preobrazhenskii's 60th birthday and 40 years of
scientific and pedagogical activities. Med. prom. 11 no.2:10-18
F '57 (MLRA 10:4)

1. Vsesoyuznyy nauchno-issledovatel'skiy vitaminnyy institut.
(CHEMISTRY, MEDICAL AND PHARMACEUTICAL)

SAMOKHVALOV, G.I.; MIROPOL'SKAYA, M.A.; LUK'YANOVA, L.V.; PREOBRAZHENSKIY,
~~MIROPOL'SKAYA, M.A.~~

Synthesis of polyene compounds. Part 13: Synthesis of polyene
ketones by pyrolysis of acetoacetic esters of tertiary acetylene
carbinols. Zhur. ob. khim. 27 no.9:2501-2506 S '57. (MIRA 11:3)
(Pyrolysis) (Ketones) (Esters)

SOV/20-123-2-27/50

Samokhvalov, G. I., Shakhova, M. K., Preobrazhenskiy, N. A.

5(3)
AUTHORS:

TITLE:

PERIODICAL:

ABSTRACT:

The Synthesis of Rutin (Sintez rutina)
(USSR)
Doklady Akademii nauk SSSR, 1958, Vol 123, Nr 2, pp 305-307

Rutin, or quercetin-3-"rutinoside" (VII), is the active substance of vitamin P. The importance of rutin is great, as (besides other substances) it can decrease the permeability and fragility of the capillaries (especially with ascorbic acid). As quercetin (V) has 5 hydroxyl groups in the molecule its production from its 3-glucosides is very difficult. Besides, there are some more difficulties (Refs 1-4) so that the synthesis of rutin or other quercetin-3-disaccharides remained unknown until recently. The authors describe the synthesis of rutin from quercetin and acetobromo rutinoside to reference 6, initial quercetin was synthesized according to the scheme, however, with the difference that the protection of the hydroxyl group in the vanillic acid was obtained by benzylolation: triethylamine (Ref 7) was used as a condensing agent. The disaccharide: α -acetobromo- β -1-L-rhamnosido-6-D-glucose,

ASE

PRES.

Card 1/3

Card 2/

Academician

SOV/79-29-6-37/72

AUTHORS: Samokhvalov, G. I., Vakulova, L. A.,
Mayranovskiy, S. G., Luk'yanova, L. V.

TITLE: Synthetic Investigations in the Field of the Polyene Compounds
(Sinteticheskiye issledovaniya v oblasti poliyenovykh soyedineniy).
XIV. The Direction of Hydration of the Acetylene Bond in a Mole-
cule Containing a Diene System Conjugated With the Carbonyl Group
(XIV. Napravleniye gidratatsii atsetilenovoy svyazi v molekule, so-
derzhashchey diynovuyu sistemu, sopryazhennuyu s karbonil'noy
gruppy)

PERIODICAL: Zhurnal obshchey khimii, 1959, Vol 29, Nr 6,
pp 1936 - 1945 (USSR)

ABSTRACT: A considerably large group of oxygen-containing carotenoids be-
longs to the natural polyene pigments. Mixoxanthin, which has a
vitamin-A effect occurs in marine invertebrates and marine algae.
Its structure has not yet been investigated in detail. Beside the
 β -ionone ring and the polyene chain, characteristic of the ca-
rotenoids, it has a cyclic or an aliphatic grouping with a carbonyl
group in position 4 (formula (I) or (II)). In synthesizing this
part of the molecule of mixoxanthin the authors tried to bring
about the hydration of 3,7-dimethyl octadiene-2,6-in-4-al accord-

Card 2,

Card 1/3

... groups,
... group (XII)
... group (XIV) (Scheme 3). The
absorption spectra of the semicar-
bonyl of the two compounds indicate the same

5(3)

AUTHORS:

Samokhvalov, G. I., Shakhova, M. K., Preobrazhenskiy, N. A. SOV/20-123-2-27/50

TITLE:

The Synthesis of Rutin (Sintez rutina)

PERIODICAL:

Doklady Akademii nauk SSSR, 1958, Vol 123, Nr 2, pp 305-307 (USSR)

ABSTRACT:

Rutin, or quercetin-3-"rutinoside" (VII), is the active substance of vitamin P. The importance of rutin is great, as (besides other substances) it can decrease the permeability and fragility of the capillaries (especially with ascorbic acid). As quercetin (V) has 5 hydroxyl groups in the molecule its production from its 3-glucosides is very difficult. Besides, there are some more difficulties (Refs 1-4) so that the synthesis of rutin or other quercetin-3-disaccharides remained unknown until recently. The authors describe the synthesis of rutin from quercetin and acetobromo rutinose (see Scheme). The initial quercetin was synthesized according to reference 6, however, with the difference that the protection of the hydroxyl group in the vanillic acid was obtained by benzylation: triethylamine (Ref 7) was used as a condensing agent. The disaccharide: α -acetobromo- β -1-L-rhamnosido-6-D-glucose,

Card 1/3

The Synthesis of Rutin

SOV/20-123-2-27/50

α -acetobromo-rutinoside was synthesized according to reference 8 from acetobromo-rhamnose and acetochloroglucose. The results of the paper chromatography, and the comparison of the ultraviolet absorption spectra (Fig. 1) showed a complete identity of synthesized and natural rutin. As quercetin under the influence of liquid ammonia partly decomposes admixtures with an ultraviolet absorption maximum occur in the chromatograms of synthetic rutin; these admixtures characterize the quercetin decomposition products. The rutin synthesis mentioned above is the final stage of its complete synthesis. An experimental part with the usual data follows. There are 2 figures and 8 references.

ASSOCIATION: Vsesoyuznyy nauchno-issledovatel'skiy vitaminnyy institut
(All-Union Scientific Vitamin Research Institute)

PRESENTED: June 30, 1958, by A. N. Nesmeyanov, Academician

Card 2/3

SOV/79-29-6-37/72

AUTHORS: Samokhvalov, G. I., Vakulova, L. A.,
Mayranovskiy, S. G., Luk'yanova, L. V.

TITLE: Synthetic Investigations in the Field of the Polyene Compounds
(Sinteticheskiye issledovaniya v oblasti poliyenovykh soedineniy).
XIV. The Direction of Hydration of the Acetylene Bond in a Molecule Containing a Diene System Conjugated With the Carbonyl Group
(XIV. Napravleniye gidratatsii atsetilenovoy svyazi v molekule, so-
derzhashchey diyatsionnyy sistem, sopryazhennuyu s karbonil'noy
gruppy)

PERIODICAL: Zhurnal obshchey khimii, 1959, Vol 29, Nr 6,
pp 1936 - 1945 (USSR)

ABSTRACT: A considerably large group of oxygen-containing carotenoids be-
longs to the natural polyene pigments. Mixoxanthin, which has a
vitamin-A effect occurs in marine invertebrates and marine algae.
Its structure has not yet been investigated in detail. Beside the
 β -ionone ring and the polyene chain, characteristic of the ca-
rotenoids, it has a cyclic or an aliphatic grouping with a carbonyl
group in position 4 (formula (I) or (II)). In synthesizing this
part of the molecule of mixoxanthin the authors tried to bring
about the hydration of 3,7-dimethyl octadiene-2,6-in-4-al accord-

Card 1/3

Synthetic Investigations in the Field of the Polyene SOV/79-29-6-37/72
Compounds. XIV. The Direction of Hydration of the Acetylene Bond in a Molecule Containing a Diene System Conjugated With the Carbonyl Group

ing to the scheme 1((III \rightarrow (IV) \rightarrow (V)). In this connection an explanation of the process of hydration is given (Refs 5-8). The synthesis of compound III was carried out according to scheme 2. This hydration was carried out in an aqueous solution of methanol of mercury sulphate with careful heating. The absence of the color reaction with iron chloride in the hydration product indicates the formation of (IV) of (V). From this product a crystalline semicarbazone with a melting point of 152-153° was obtained which according to its composition corresponds to the keto aldehyde $C_{10}H_{14}O_2$. For the purpose of comparing the optical and polarographic properties of this compound the keto aldehyde (XI), with already determined position of the carbonyl groups, was synthesized and its semicarbazones at the aldehyde group (XII) were obtained (melting point 197-198°) with a certain position of the semicarbazone residue at the keto group (XIV)(Scheme 3). The comparison of the ultraviolet absorption spectra of the semicarbazone of the keto aldehyde $C_{10}H_{14}O_2$ (Figs 1,2) as well as the polarographic comparison of the two compounds indicate the same

Card 2/3

Synthetic Investigations in the Field of the Polyene SOV/79-29-6-37/72
Compounds. XIV. The Direction of Hydration of the Acetylene Bond in a Molecule Containing a Diene System Conjugated With the Carbonyl Group

structure with respect to the position of the carbonyl groups (Fig 3). Thus, 3,7-dimethyl octadiene-2,5-on-4-al (V) in the case of which all compounds contained are conjugated, is formed in the hydration of the triple bond in the molecule (III) containing a diene system conjugated with the carbonyl group. The infrared absorption spectra taken confirm the conclusions drawn. The authors thank N. A. Preobrazhenskiy for the interest he showed in the investigations. There are 5 figures, 1 table, and 18 references, 6 of which are Soviet.

ASSOCIATION: Vsesoyuznyy nauchno-issledovatel'skiy vitaminnyy institut (All-Union Scientific Research Institute for Vitamins)

SUBMITTED: April 14, 1958

Card 3/3

SOV/79-29-8-25/81

5(3)

AUTHORS:

~~Samokhvalov, G. I., Vakulova, L. A., Men, T. V., Zhikhareva, L.T.,~~
Koltunova, V. I., Preobrazhenskiy, N. A.

TITLE:

Synthetic Investigations in the Field of Polyene Compounds
XV. A Complete Synthesis of Citral

PERIODICAL:

Zhurnal obshchey khimii, 1959, Vol 29, Nr 8, pp 2575-2578
(USSR)

ABSTRACT:

Citral is the initial product for the synthesis of vitamin A, the carotinoids, and a number of fragrant substances. The transition of compound (I)*, which was also synthesized by the authors, from acetone and acetylene (Refs 1,2,3) to citral has so far been carried out by condensation with magnesium bromoethoxy-acetylene, partial hydrogenation, and saponification of the resultant 1-ethoxy-3,7-dimethyl-octadien-2,6-ol-3 (Ref 4), as well as according to reference 5. In the present paper the synthesis of citral from (I) is carried out without organo-metallic compound according to the given scheme. Otherwise, compound (II) is formed when using the easily accessible tetraethoxy-silane in the presence of orthophosphoric acid, a small quantity of p-toluene-sulfonic acid, and 0.3 mole of

Card 1/2

*(I): 6-methyl-heptene-5-one-2.

SOV/79-29-8-25/81

Synthetic Investigations in the Field of Polyene Compounds. XV. A Complete Synthesis of Citral

alcohol per 1 mole of initial ketone (95-97%) (Ref 6). The authors investigated the reaction of the ketal (II) with the ethyl-vinyl ether under the influence of the catalysts $ZnCl_2$ and $4BR_3 \cdot 3(C_2H_5)_2O$. $ZnCl_2$ was found to give less side products on condensation, and to produce compound (III) in a 60-65% yield. In the subsequent saponification reaction, under separation of one molecule of alcohol, citral is formed under the influence of a 15% sodium-acetate solution and acetic acid for 30 min at 108-110°. The yield is 42-45%. A prolonged reaction time causes an autocondensation of the citral. The purification of citral is carried out via its bisulfite derivative. There are 1 figure and 9 references, 4 of which are Soviet.

ASSOCIATION: Vsesoyuznyy nauchno-issledovatel'skiy vitaminnyy institut
(All-Union Scientific Institute for Vitamin Research)

SUBMITTED: July 14, 1958
Card 2/2

5 (3)

AUTHORS: Samokhvalov, G. I., Zakharkin, L. I., SOV/20-126-5-28/69
Davydova, L. P., Khorlina, I. M.

TITLE: A New Synthesis of β -Ionolidenacetic Aldehyde (Novyy sintez β -ionolidenuksusnogo al'degida)

PERIODICAL: Doklady Akademii nauk SSSR, 1959, Vol 126, Nr 5, pp 1013 - 1016 (USSR)

ABSTRACT: "9,13 dimethyl-7-(1,1,5 trimethyl-cyclohexene-5-y1)-octatriene 8,10,12 al 14; aldehyde C_{19} (I)" is an intermediate product of the β -carotene synthesis (Ref 1). The extension of the carbon chain of this compound by one atom and the creation of a conjugate system of double bonds renders the transition to stereo-isomeric retinal aldehydes possible, which corresponds to the vitamin A. The above mentioned chain-extension is based on the formation of cyanohydrins (Refs 2,3). For the reduction of the nitriles, arising after the dehydration, di-isobutyl-aluminum hydride (Ref 4) could be used. The authors describe a realisation of this method with reference to a simple example: The synthesis mentioned in the title (Ref 5) of 7-(1,1,5 trimethyl-cyclohexene-5-y1)-9-methyl butene-8-al-10 of β - C_{14} al-

Card 1/3

A New Synthesis of β -Ionolidenacetic Aldehyde

SOV/20-126-5-28/69

dehyde (II) (see scheme). The interaction between aldehyde C₁₄ (II) with acetone-cyanohydrine takes place under the influence of a methanol solution of potash at 20-23°. The oxy-nitrile yield (III) amounts to 83-84%. By the reduction of the nitrile- β -ionolide-acetic-acid (Fig 1) (IV) the substance mentioned in the title (V) was produced as a stereo-isomeric mixture, and was isolated. In the crystallization of the semi-carbazones of the stereo-isomeric-aldehydes from alcohol trans- β -ionolide acetic aldehyde semi-carbazone was obtained (melting point 195.5°-196° Refs 7,8), and a far smaller quantity of the cis-isomers (melting point 173-174°). A far-reaching agreement of the maxima of the ultra-violet absorption spectra of the carbazones of the isomeric aldehydes (Fig 2) allows the conclusion that the isomery is caused by a deviation of the position of the substituents with regard to the newly formed, sterically not impeded, double-bond of the carbon atoms 9-10. Out of the carbazone of the trans- β -ionolide-acetic aldehyde free aldehyde was obtained. The infrared spectrum (Fig 3) is characteristic of substances with a trans-position of the substituents at the double bond. Bands in the range of 6.25 μ belong to the

Card 2/3

A New Synthesis of β -Ionolidenacetic Aldehyde

SOV/20-126-5-28/69

oscillations of the system of conjugate double bonds, whilst those at 6μ correspond to the γ -oscillation $C=O$ in the system with conjugate unsaturated bonds. Prof. N. A. Preobrazhenskiy showed interest in this investigation. There are 3 figures and 8 references, 2 of which are Soviet.

ASSOCIATION: Vsesoyuznyy nauchno-issledovatel'skiy vitaminnyy institut (All-Union Scientific Vitamin Research Institute). Institut elementoorganicheskikh soyedineniy Akademii nauk SSSR (Institute of Elemental Organic Compounds of the Academy of Sciences, USSR)

PRESENTED: March 11, 1959, by M. I. Kabachnik, Academician

SUBMITTED: March 9, 1959

Card 3/3

SAMOKHVALOV, G. I., Doc Chem Sci -- (diss) "Research into the chemistry of poly-unsaturated compounds." Moscow, 1960. 27 pp; (Ministry of Higher and Secondary Specialist Education RSFSR, Moscow Inst of Fine Chemical Technology im M. V. Lomonosov); 200 copies; price not given; list of author's works at end of text (15 entries); (KL, 18-60, 146)